

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

ABB DRIVES

FSCA-01 3BHE030763R0002

RS-485 FIELDBUS ADAPTER MODULE

Applicable product family: ABB drives serial communication

OFFICIAL SOURCE

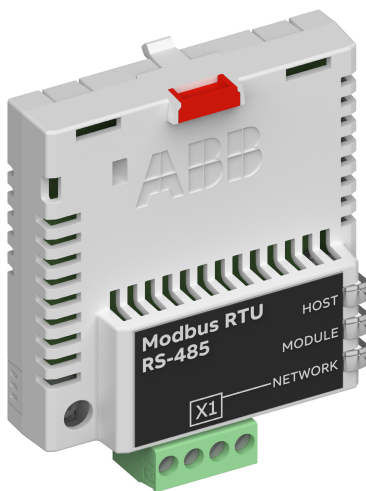
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The following pages are selected from the supplied manufacturer document and retain their original page content.

OPTION FOR ABB DRIVES, CONVERTERS AND INVERTERS

FSCA-01 RS-485 adapter module

User's manual



Drive firmware manuals and guides

<i>ACSM1 motion control program FW manual</i>	3AFE68848270
<i>ACSM1 speed and torque control program FW manual</i>	3AFE68848261
<i>ACSM1 regen supply control program FW manual</i>	3AUA0000052174
<i>ACS850 standard control program FW manual</i>	3AUA0000045497
<i>ACQ810 standard pump control program FW manual</i>	3AUA0000055144
<i>ACS880 primary control program FW manual</i>	3AUA0000085967
<i>ACH580 HVAC control program FW manual</i>	3AXD50000027537
<i>ACS580 standard ctrl program FW manual</i>	3AXD50000016097

Option manuals and guides

<i>FSCA-01 RS-485 adapter module user's manual</i>	3AUA0000109533
<i>FSCA-01 RS-485 adapter module quick guide</i>	3AXD50000158546

Contents

The manual consists of the following chapters:

- [Safety instructions](#) contains the safety instructions which you must follow when installing a fieldbus adapter module.
 - [About the manual](#) introduces this manual.
 - [Overview of the RS-485 network and the FSCA-01 module](#) contains a short description of the RS-485 network and the adapter module.
 - [Mechanical installation](#) contains a delivery checklist and instructions to install the adapter module.
 - [Electrical installation](#) contains instructions on cabling, connecting the module to the RS-485 network and bus termination.
 - [Start-up](#) presents the steps to take during the start-up of the drive with the adapter module and gives information on configuring the master.
 - [Communication profiles](#) describes the communication profiles used in the communication between the master, the adapter module and the drive.
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Overview of the RS-485 network and the FSCA-01 module

What this chapter contains

This chapter contains a short description of the RS-485 network and the FSCA-01 RS-485 adapter module.

RS-485 network

RS-485 (EIA-485, TIA-485) is a balanced (differential) serial interface standard for communication over a twisted-pair cable. Because the RS-485 signal transmission is differential, it provides better protection against noise and longer transmission distances than RS-232. RS-485 is a half-duplex multi-drop network, which means that multiple devices may reside on line. Only one transmitter may be active at any given time.

The RS-485 standard specifies only the electrical characteristics of the bus system. The communication protocol and communication speed depend on the application used. For example, the electrical characteristics of the Modbus protocol are based on the RS-485 standard.

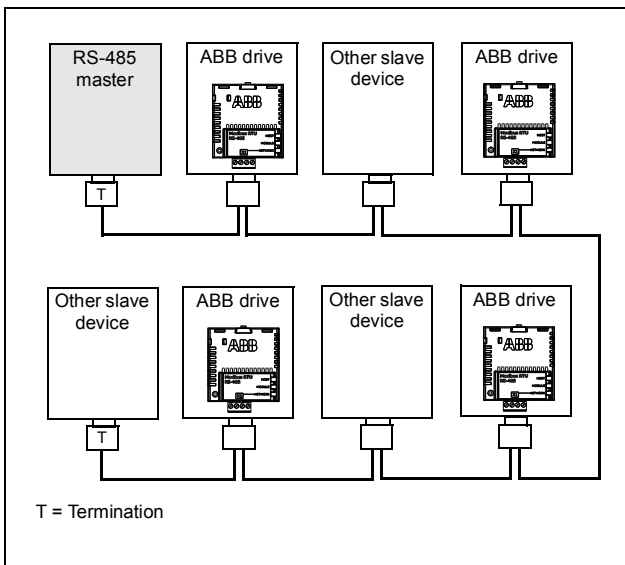
The RS-485 transmission line consists of two wires, A and B (balanced pair). The signal transmission is based on the voltage difference between the wires. The minimum detected voltage difference is 200 mV. The potential difference between the two wires determines the logic state bit: when B is at a higher voltage than A, the state is defined as bit 1 (data high) and when A is at a higher voltage than B, the state is defined as bit 0 (data low).

The maximum common mode voltage between RS-485 network devices is limited to $-7 \dots +12$ V. A ground wire and cable shield should be connected to prevent the common mode voltage between the network devices from drifting outside the allowable limits.

The RS-485 bus cable should be terminated with a 120 ohm resistor at both ends to prevent signal reflection. When no device on the network is transmitting, noise can be falsely interpreted as communication data. To avoid this, a termination can be included with a fail-safe circuit (pull-up and pull-down resistors). The circuit forces the bus into a known idle state when no device is transmitting.

■ Example topology of the RS-485 link

The figure below shows an example of an allowable topology of FSCA-01 RS-485 link.



FSCA-01 RS-485 adapter module

The FSCA-01 RS-485 adapter module is an optional device for ABB drives which enables the connection of the drive to an RS-485 network. The adapter module provides galvanic isolation between the drive and RS-485 network and converts the serial communication signals of the drive to the RS-485 signal levels.

The adapter module has a built-in bus termination with fail-safe circuitry. The termination can be activated with a jumper. For instructions, see chapter [Electrical installation](#).

Through the adapter module you can:

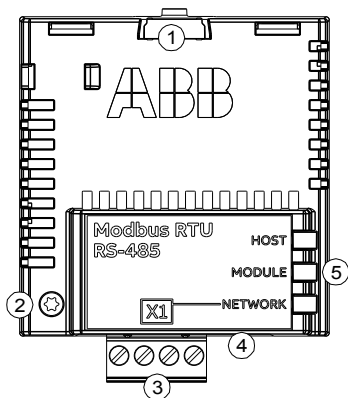
- give control commands to the drive (for example, Start, Stop, Run enable)
- feed a motor speed or torque reference to the drive
- give a process actual value or a process reference to the PID controller of the drive
- read status information and actual values from the drive
- change drive parameter values
- reset a drive fault.

The communication protocol used to access these functionalities over the RS-485 connection is described in chapter [Communication protocol](#).

The adapter module is mounted into an option slot on the motor control board of the drive. See the drive manuals for module placement options.

Layout of the adapter module

The figure below shows the layout of FSCA-01 adapter module.



No.	Description	See chapter
1	Lock	Mechanical installation
2	Mounting screw	Mechanical installation
3	Bus connector X1	Electrical installation
4	Termination jumper J2	Electrical installation
5	Diagnostic LEDs	Diagnostics

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Mechanical installation

What this chapter contains

This chapter contains a delivery checklist and instructions to install the adapter module.

Necessary tools and instructions

You will need a Torx TX10 screwdriver to secure the FSCA adapter module to the drive. See also, the applicable drive hardware manual.



Unpacking and examining the delivery

1. Open the option package.
 2. Make sure that the package contains:
 - FSCA-01 RS-485 adapter module
 - this manual.
 3. Make sure that there are no signs of damage.
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Electrical installation

What this chapter contains

This chapter contains:

- general cabling instructions
- instructions on connecting the module to the RS-485 network
- instructions on switching on the bus termination.

Warnings



WARNING! Obey the safety instructions. See chapter [Safety instructions](#) on page 9. If you ignore the safety instructions, injury or death can occur. If you are not a qualified electrician, do not do electrical work.

Necessary tools and instructions

See the applicable drive hardware manual.



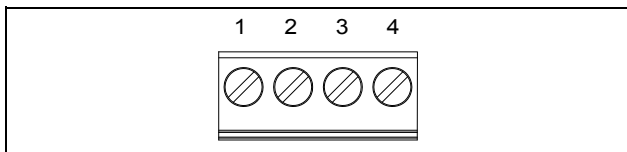
General cabling instructions

- Arrange the bus cables as far away from the motor cables as possible.
- Avoid parallel runs.
- Use bushings at cable entries.

Connecting the module to the RS-485 network

Connect the bus cable to connector X1 on the adapter module.

The pin allocation of the X1 connector is shown below.



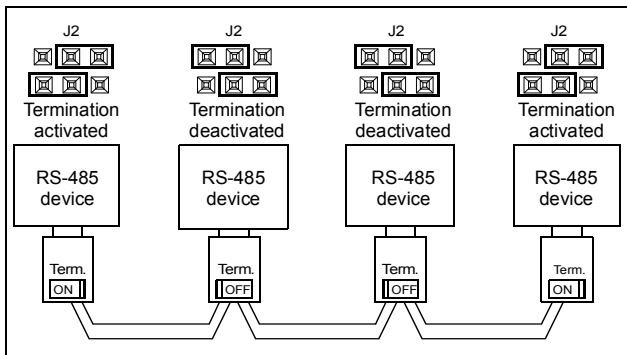
X1		Description
1	SHLD	Bus cable shield. Connected internally to GND_B and CH_GND (chassis) via RC filters.
2	DATA_B	Data positive
3	DATA_A	Data negative
4	GND_B	Isolated signal ground



Switching on the bus termination

Bus termination is required to prevent signal reflections from the bus cable ends. The adapter module is equipped with internal bus termination, which is configurable with jumper J2 pins.

Activate the termination on the devices located at the bus ends and deactivate it on the other devices. See the figure below.





Drive configuration

The following information applies to all drive types compatible with the adapter module, unless otherwise stated.

■ Modbus/RTU connection configuration

After the adapter module has been mechanically and electrically installed according to the instructions in chapters [Mechanical installation](#) and [Electrical installation](#), you must prepare the drive for communication with the module.

The detailed procedure of activating the module for Modbus/RTU communication with the drive depends on the drive type. Normally, you must adjust a parameter to activate the communication. See the drive-specific start-up procedures starting on page [45](#).

Once communication between the drive and the adapter module has been established, several configuration parameters are copied to the drive. These parameters are shown in the tables below and must be checked first and adjusted where necessary.

Note that not all drives display descriptive names for the configuration parameters. To help you identify the parameters in different drives, the names displayed by each drive are given in grey boxes in the tables.

Note: The new settings take effect only when the adapter module is powered up the next time or when the fieldbus adapter refresh parameter is activated.



FSCA-01 configuration parameters – group A (group 1)

Note: The actual parameter group number depends on the drive type. Group A (group 1) corresponds to:

- parameter group 51 in ACS355, ACSM1, ACS530, ACS850 and ACQ810
- parameter group 51 in ACS880 if the adapter is installed as fieldbus adapter A or group 54 if the adapter is installed as fieldbus adapter B.

No.	Name/Value	Description	Default
01	FBA TYPE	Read-only. Shows the fieldbus adapter type as detected by the drive. The value cannot be adjusted by the user. If the value is 0 = None, the communication between the drive and the module has not been established.	485 = RS-485
02	Profile	Selects the communication profile for the network connection. Note: The communication protocol is selected with parameter 25 Protocol .	0 = ABB Classic
	0 = ABB Classic	Modbus/RTU protocol with ABB Drives profile - Classic	
	1 = ABB Enhanced	Modbus/RTU protocol with ABB Drives profile - Enhanced	
	2 = Transp 16	Modbus/RTU protocol with Transparent 16-bit profile	
	3 = Transp 32	Modbus/RTU protocol with Transparent 32-bit profile	
03	Station ID	Defines the address of the device. Two units with the same address are not allowed on-line.	1
	1...247	Address of the device	
04	Baud rate	Selects the baud rate of the link.	0 = 9.6 kbit/s
	0 = 9.6 kbit/s	9.6 kbit/s	
	1 = 19.2 kbit/s	19.2 kbit/s	
	2 = 38.4 kbit/s	38.4 kbit/s	
	3 = 57.6 kbit/s	57.6 kbit/s	
	4 = 115.2 kbit/s	115.2 kbit/s	



FSCA-01 configuration parameters – group B (group 2)

Note: The actual parameter group number depends on the drive type. Group B (group 2) corresponds to:

- parameter group 55 in ACS355
- parameter group 53 in ACSM1, ACS530, ACS850 and ACQ810
- parameter group 53 in ACS880 if the adapter is installed as fieldbus adapter A or group 56 if the adapter is installed as fieldbus adapter B

No. ¹⁾	Name/Value	Description	Default						
01	FBA data out1 (master to drive)	Selects the drive parameter address into which the value of the DATA OUT 1 register is written (from the master to the server). The Modbus register address maps are explained in chapter Communication protocol. The content is defined by a decimal number in the range of 0 to 9999 as follows: <table><tr><td>0</td><td>Not used</td></tr><tr><td>1...99</td><td>Virtual address area of drive control. Not used with Modbus/RTU.</td></tr><tr><td>101...9999</td><td>Parameter area of the drive</td></tr></table>	0	Not used	1...99	Virtual address area of drive control. Not used with Modbus/RTU.	101...9999	Parameter area of the drive	0 = None
0	Not used								
1...99	Virtual address area of drive control. Not used with Modbus/RTU.								
101...9999	Parameter area of the drive								
	0 = None	Not used							
	101...9999	Parameter index with format xyyy , where • xx is the parameter group number (1...99) • yy is the parameter number index within that group (01...99).							
	Other	Path to parameter area selection.							
02... 12	FBA data out2... FBA data out12	See parameter 01 FBA data out1 .	0 = None						

¹⁾ The number of parameters in this group may vary by drive type and drive firmware.

FSCA-01 configuration parameters – group C (group 3)

Note: The actual parameter group number depends on the drive type. Group C (group 3) corresponds to:

- parameter group 54 in ACS355
- parameter group 52 in ACSM1, ACS530, ACS850 and ACQ810
- parameter group 52 in ACS880 if the adapter is installed as fieldbus adapter A or group 55 if the adapter is installed as fieldbus adapter B.

No. ¹⁾	Name/Value	Description	Default						
01	FBA data in1 (drive to master)	Selects the drive parameter address from which the data is read to the DATA IN 1 register (from the server to the master). The Modbus register address maps are explained in chapter Communication protocol. The content is defined by a decimal number in the range of 0 to 9999 as follows: <table><tr><td>0</td><td>Not used</td></tr><tr><td>1...99</td><td>Virtual address area of drive control. Not used with Modbus/RTU.</td></tr><tr><td>101... 9999</td><td>Parameter area of the drive</td></tr></table>	0	Not used	1...99	Virtual address area of drive control. Not used with Modbus/RTU.	101... 9999	Parameter area of the drive	0 = None
0	Not used								
1...99	Virtual address area of drive control. Not used with Modbus/RTU.								
101... 9999	Parameter area of the drive								
	0 = None	Not used							
	101...9999	Parameter index with format xxyy , where • xx is the parameter group number (1...99) • yy is the parameter number index within that group (01...99).							
	Other	Path to parameter area selection.							
02... 12	FBA data in2... FBA data in12	See parameter 01 FBA data in1 .	0 = None						

¹⁾ The number of parameters in this group may vary by drive type and drive firmware.



Starting up ACS355 drives

1. Power up the drive.
2. Enable the communication between the adapter module and the drive by setting parameter **9802 COMM PROT SEL** to EXT FBA.
3. Set the FSCA-01 configuration parameters in group 51.
 - Select the communication protocol with parameter 5125 and profile with parameter 5102.
 - Configure the network settings with parameters 5103...5105.
 - With parameters 5106 and 5107, select how the adapter module detects fieldbus communication breaks.
4. With parameter **3018 COMM FAULT FUNC**, select how the drive reacts to a fieldbus communication break.
5. With parameter **3019 COMM FAULT TIME**, define the time between communication break detection and the selected action.
6. Define the process data transferred to and from the drive in the FSCA-01 configuration parameter groups 54 and 55.

Note: The adapter module assigns the Control word, Status word, references 1...2 and actual values 1...2 automatically to Modbus registers. Process data groups are not available for the ABB Drives - Classic communication profile.
7. Validate the settings made in parameter groups 51, 54 and 55 by setting parameter **5127 FBA PAR REFRESH** to REFRESH.
8. Set the relevant drive control parameters to control the drive according to the application. Examples of appropriate values are shown in the tables below.



Drive parameter	Setting for ACS355 drives	Description
5102 FB PAR 2 (PROFILE)	1 (= ABB Enhanced)	Selects the ABB Drives - Enhanced profile.
5103 FB PAR 3 (STATION ID)	3 ²⁾	Defines the address of the device.
5104 FB PAR 4 (BAUD RATE)	4 (= 115.2 kbit/s) ²⁾	Selects the baud rate of the link. Note: The baud rate of the master has to be the same.
5105 FB PAR 5 (PARITY)	0 (= 8 None 1) ²⁾	Defines the use of parity and stop bit(s) and the data length. Note: The parity setting of the master has to be the same.
5106 FB PAR 6 (MODBUS TIMEOUT)	10 ²⁾	Sets the communication timeout as 1 second.
5107 FB PAR 7 (TIMEOUT MODE)	2 (=Ctrl write) ²⁾	The timeout feature monitors the updating of the Control word and Reference 1.
3018 COMM FAULT FUNC	1 = FAULT ²⁾	Enables fieldbus communication fault monitoring.
3019 COMM FAULT TIME	3.0 s ²⁾	Defines the fieldbus communication break supervision time.
5401 FBA DATA IN 1	106 ²⁾	Power
5402 FBA DATA IN 2	107 ²⁾	DC bus voltage
5501 FBA DATA OUT 1	1202 ²⁾	Constant speed 1
5502 FBA DATA OUT 2	1203 ²⁾	Constant speed 2
5127 FBA PAR REFRESH	1 = REFRESH	Validates the FSAC-01 configuration parameter settings.
9904 MOTOR CTRL MODE	2 = VECTOR: TORQ	Selects the vector control mode as the motor control mode.
1001 EXT1 COMMANDS	10 = COMM	Selects the fieldbus interface as the source of the start and stop commands for external control location 1.
1002 EXT2 COMMANDS	10 = COMM	Selects the fieldbus interface as the source of the start and stop commands for external control location 2.



Starting up ACSM1 drives

1. Power up the drive.
2. Enable the communication between the adapter module and the drive by setting parameter **50.01 FBA ENABLE** to Enable.
3. With parameter **50.02 COMM LOSS FUNC**, select how the drive reacts to a fieldbus communication break.
Note that this function monitors both communication between the fieldbus master and the adapter module and communication between the adapter module and the drive.
4. With parameter **50.03 COMM LOSS T OUT**, define the time between communication break detection and the selected action.
5. Select application-specific values for parameters **50.04...50.11**. Examples of appropriate values are shown in the tables below.
6. Set the FSCA-01 configuration parameters in group **51**.
 - Select the communication protocol with parameter **51.25** and profile with parameter **51.02**.
 - Configure the network settings with parameters **51.03...51.05**.
 - With parameters **51.06** and **51.07**, select how the adapter module detects fieldbus communication breaks.



7. Define the process data transferred to and from the drive in the FSCA-01 configuration parameter groups 52 and 53.

Note 1: The adapter module assigns the Control word, Status word, references 1...2 and actual values 1...2 automatically to Modbus registers. Process data groups are not available in the ABB Drives - Classic communication profile.

Note 2: With 32-bit parameters, one can only assign process data to every second configuration parameter (eg, 52.01, 52.03, 52.05, and so on).

8. Validate the settings made in parameter groups 51, 52 and 53 by setting parameter **51.27 FBA PAR REFRESH** to REFRESH.
9. Set the relevant drive control parameters to control the drive according to the application. Examples of appropriate values are shown in the tables below.

Parameter setting examples – ACSM1

Speed and torque control using the ABB Drives - Enhanced communication profile

This example shows how to configure a speed and torque control application that uses the ABB Drives - Enhanced profile. In addition, some application-specific data is added to the communication.



The start/stop commands and reference are according to the ABB Drives profile. For more information, see the state machine on page 65.

When Reference 1 (REF1) is used, a reference value of ± 20000 (4E20h) corresponds to the reference set with parameter 25.02 SPEED SCALING in the forward and reverse directions.

When Reference 2 (REF2) is used, a reference value of ± 10000 (2710h) corresponds to the reference set with parameter 32.04 TORQUE REF 1 MAX in the forward and reverse directions.